JPSS-3 VIIRS Pre-launch (Preliminary) Spectral Calibration

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MODIS/VIIRS Calibration Workshop

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JPSS-3 VIIRS Spectral Calibration

- Spectral characterization relies entirely on prelaunch measurements (no direct on-orbit measurement)
- Spectral measurements by two independent test setups
  - GLAMR (laser source with integrating sphere)
    - All 3 DNB gain stages
    - VisNIR M and I bands
    - SWIR M and I bands (out to 2500 nm)
  - SpMA (dual monochromator)
    - All bands except DNBHGS
    - Complete spectral coverage (360-14000nm)
- Supports population of SDR/L1B LUTS
- Available to prelaunch simulation exercises and studies
- Available to on-orbit EDRs/L2 products for simulating geophysical observations

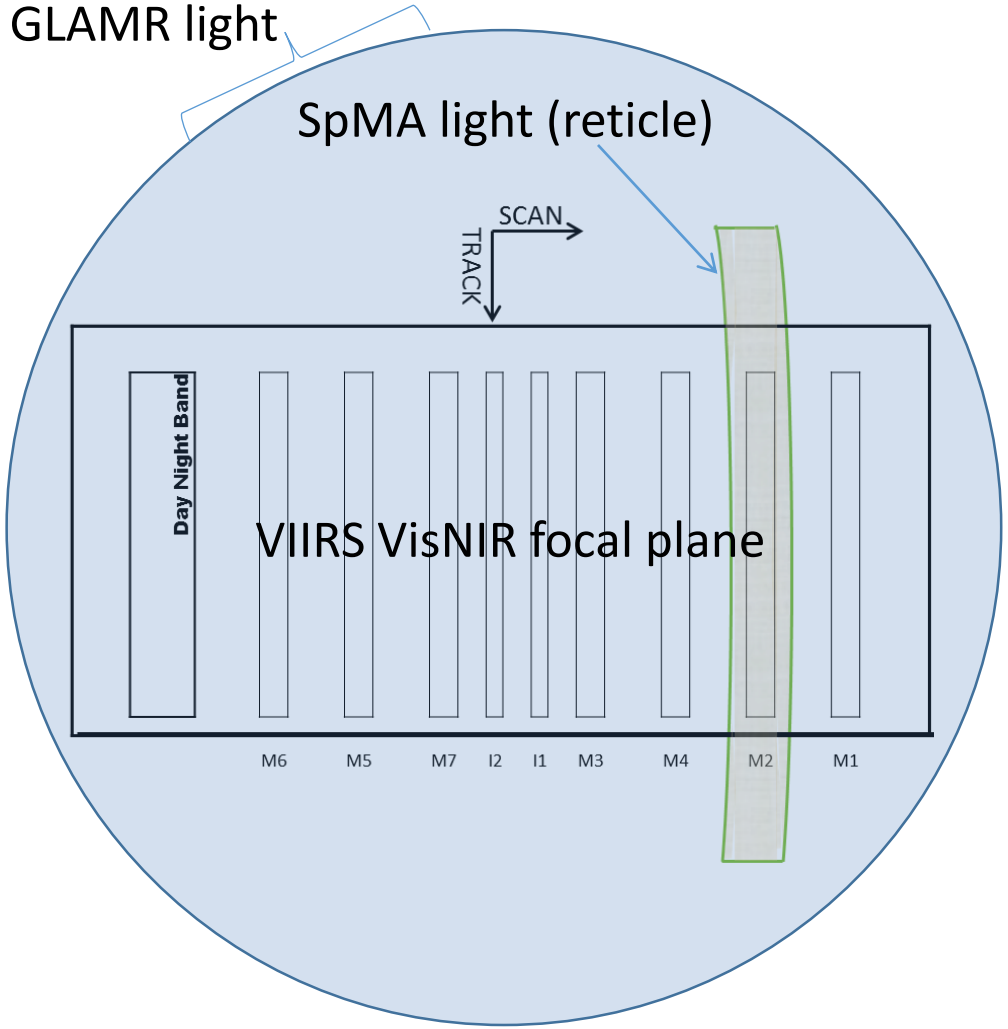
Measurements: Illumination Characteristics

GLAMR sampling strategy at each wavelength

- Light on detectors for 15-28 seconds (Dn_{open})
- Shutter closed (dark) for 15-28 seconds (Dn_{closed})

SpMA sampling strategy at each wavelength

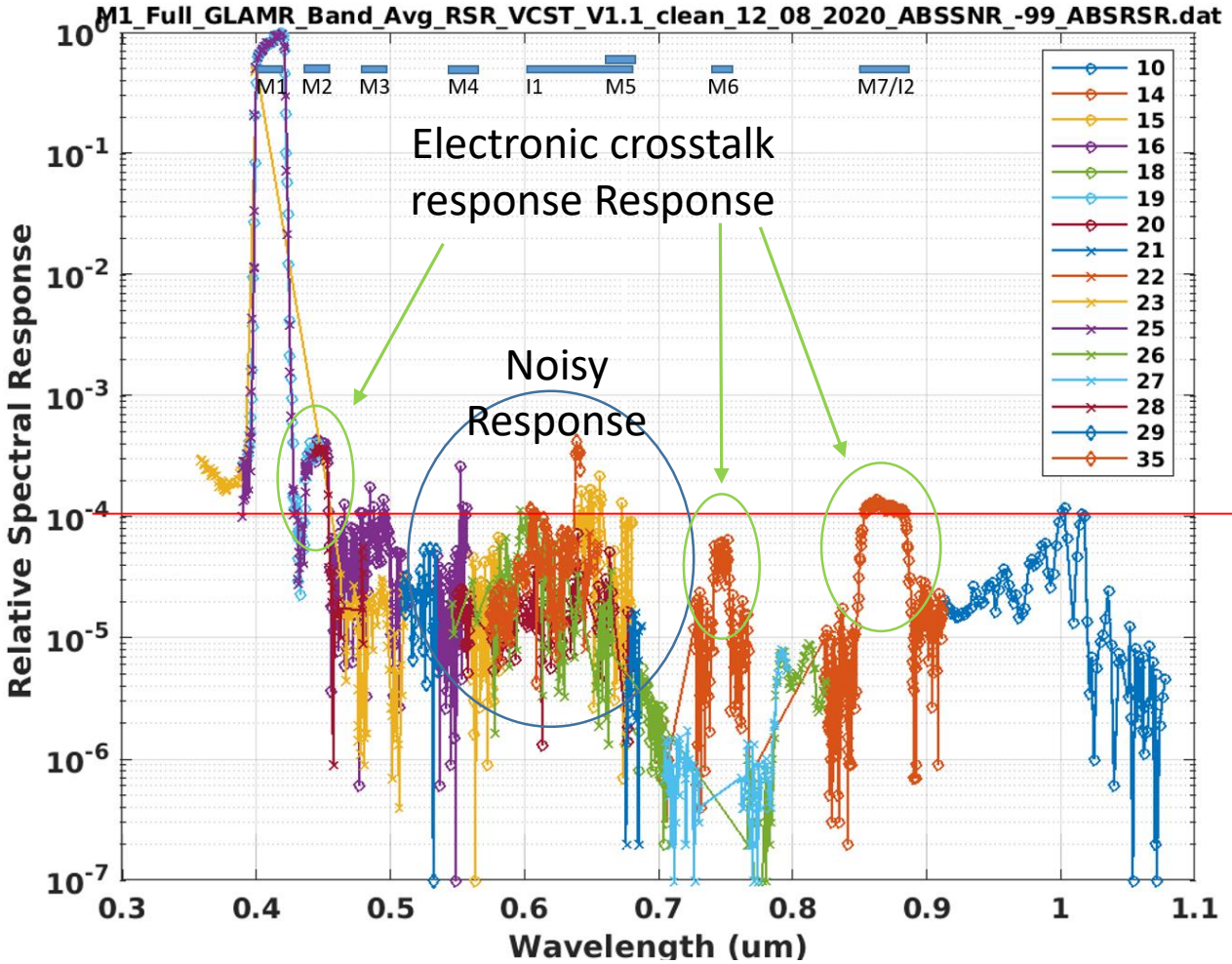
- Alternating sets of 2 light/2 dark "scans"
- 8 total scans (4 light on detector; 4 dark)



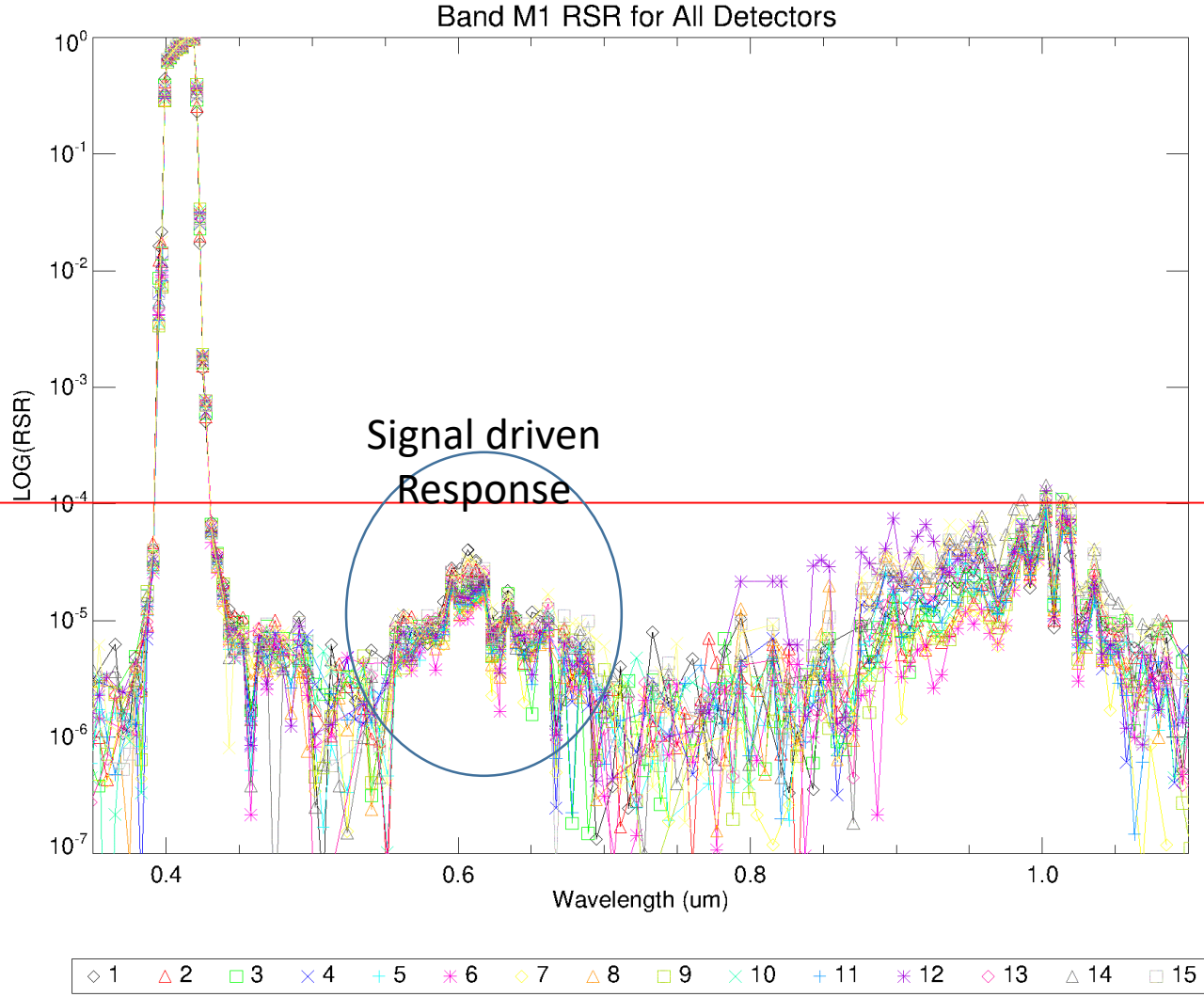
SpMA (All Bands)	**GLAMR (VisNIR/SWIR)**
• Slit illumination	• Flood illumination
• Polarized	• Unpolarized
• Spectral smile	• Spectrally flat
• >30% source non-uniformity along-track	• <10% source non-uniformity along-track
• Offline source monitoring	• Realtime source monitoring
• 5 to 6 decades of VisNIR response	• 4 to 5 decades of VisNIR response
• Contiguous spectral sampling	• "Picket-fence" spectral sampling

PRELIMINARY

GLAMR

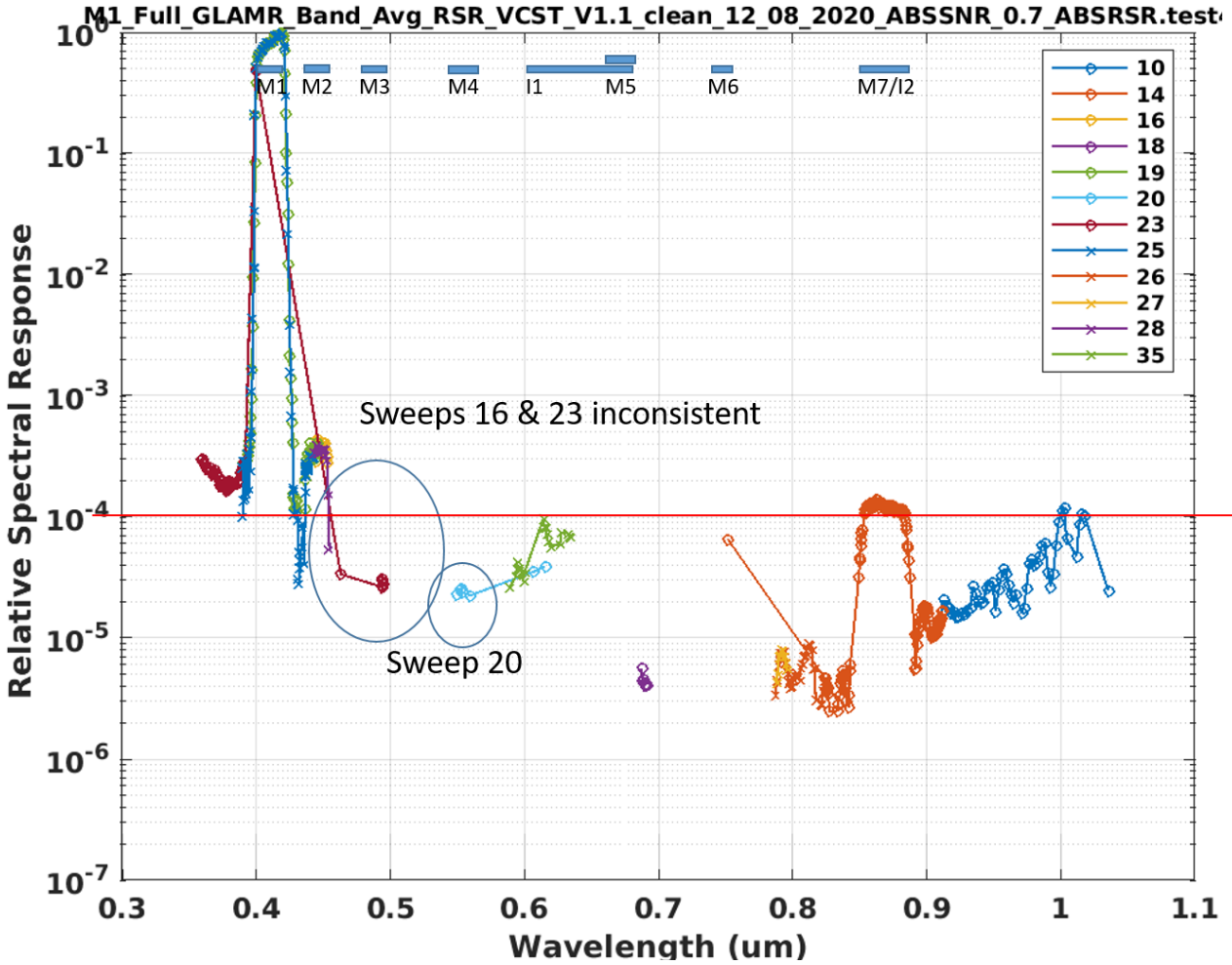


SpMA

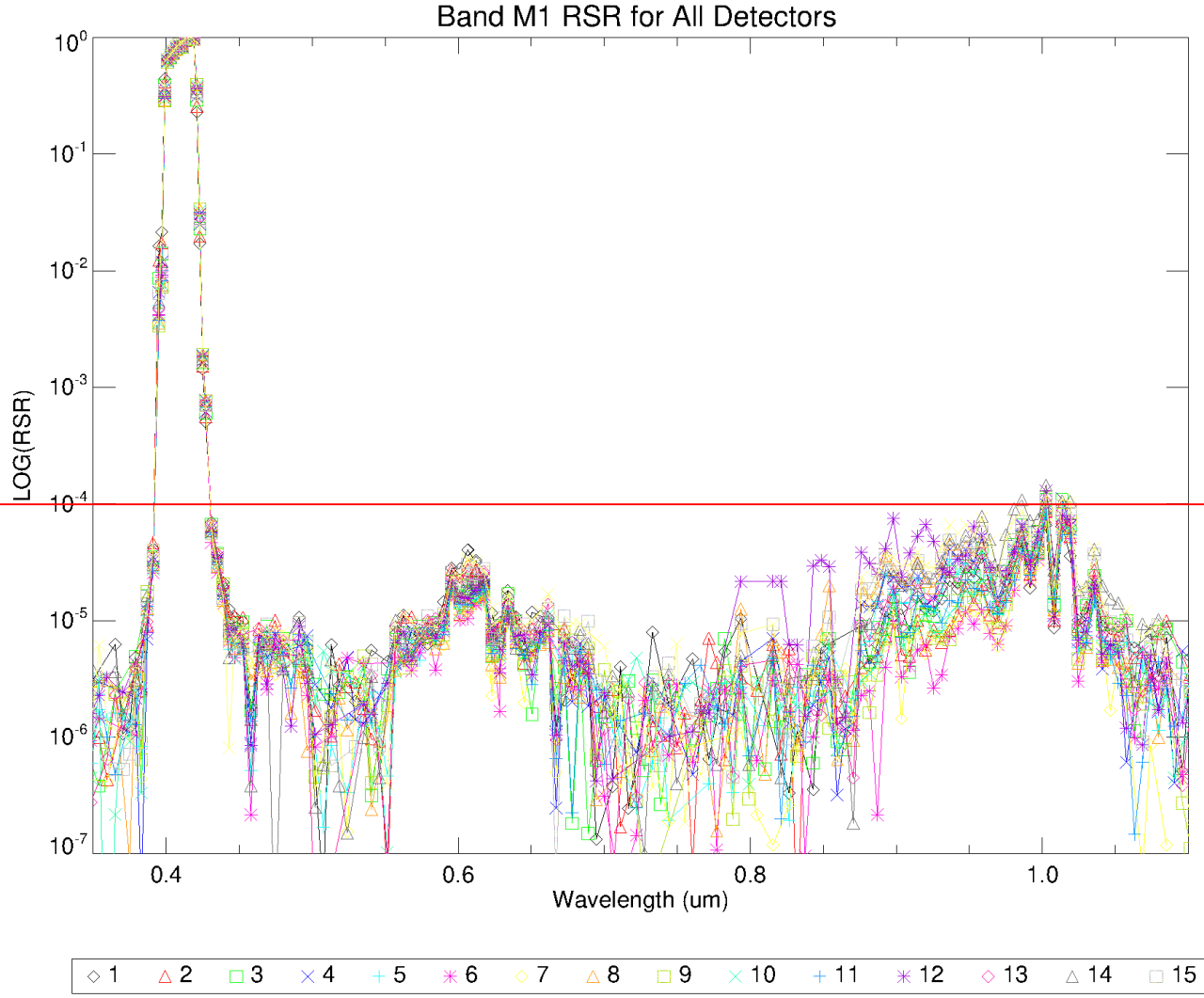


PRELIMINARY

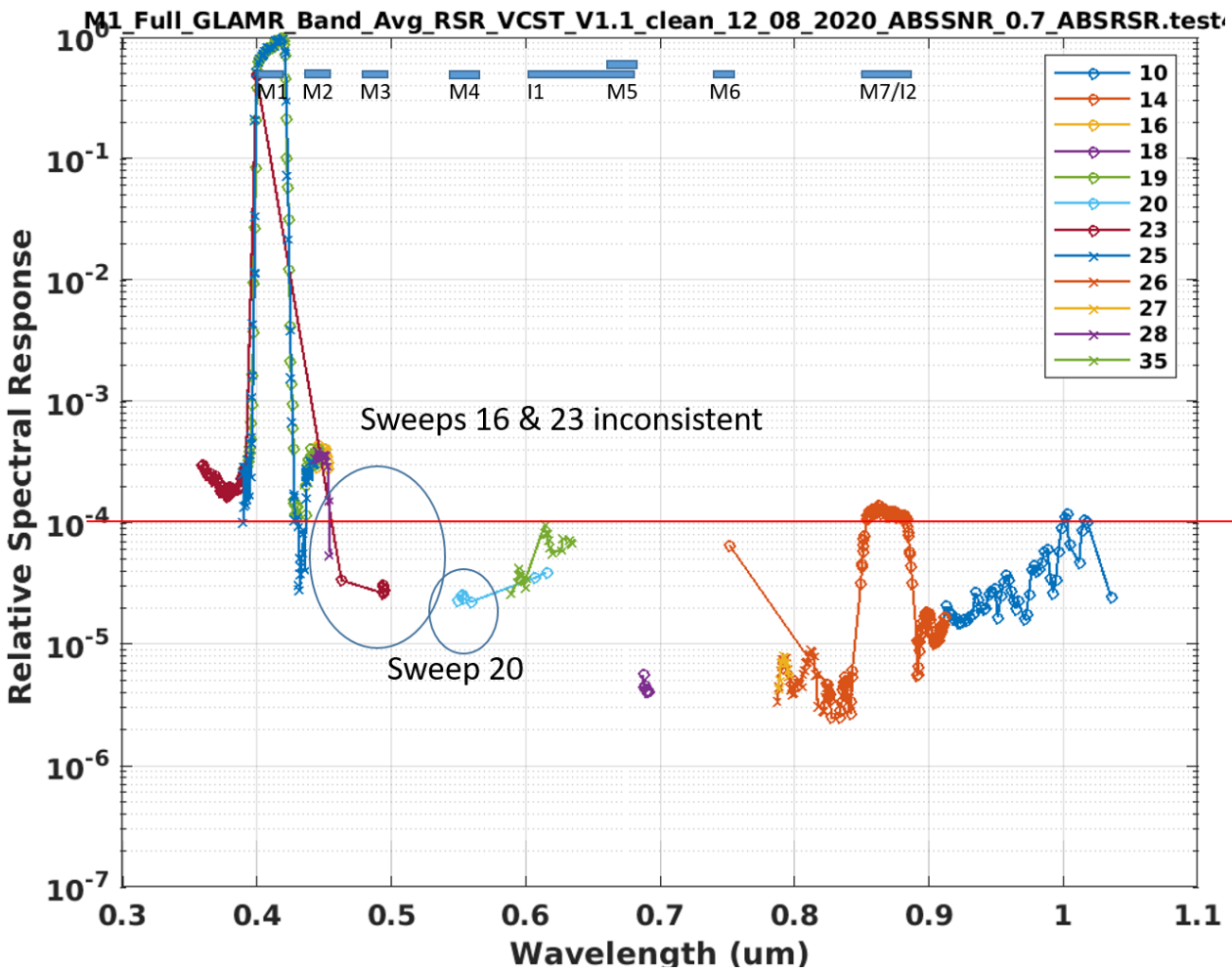
GLAMR Filtered



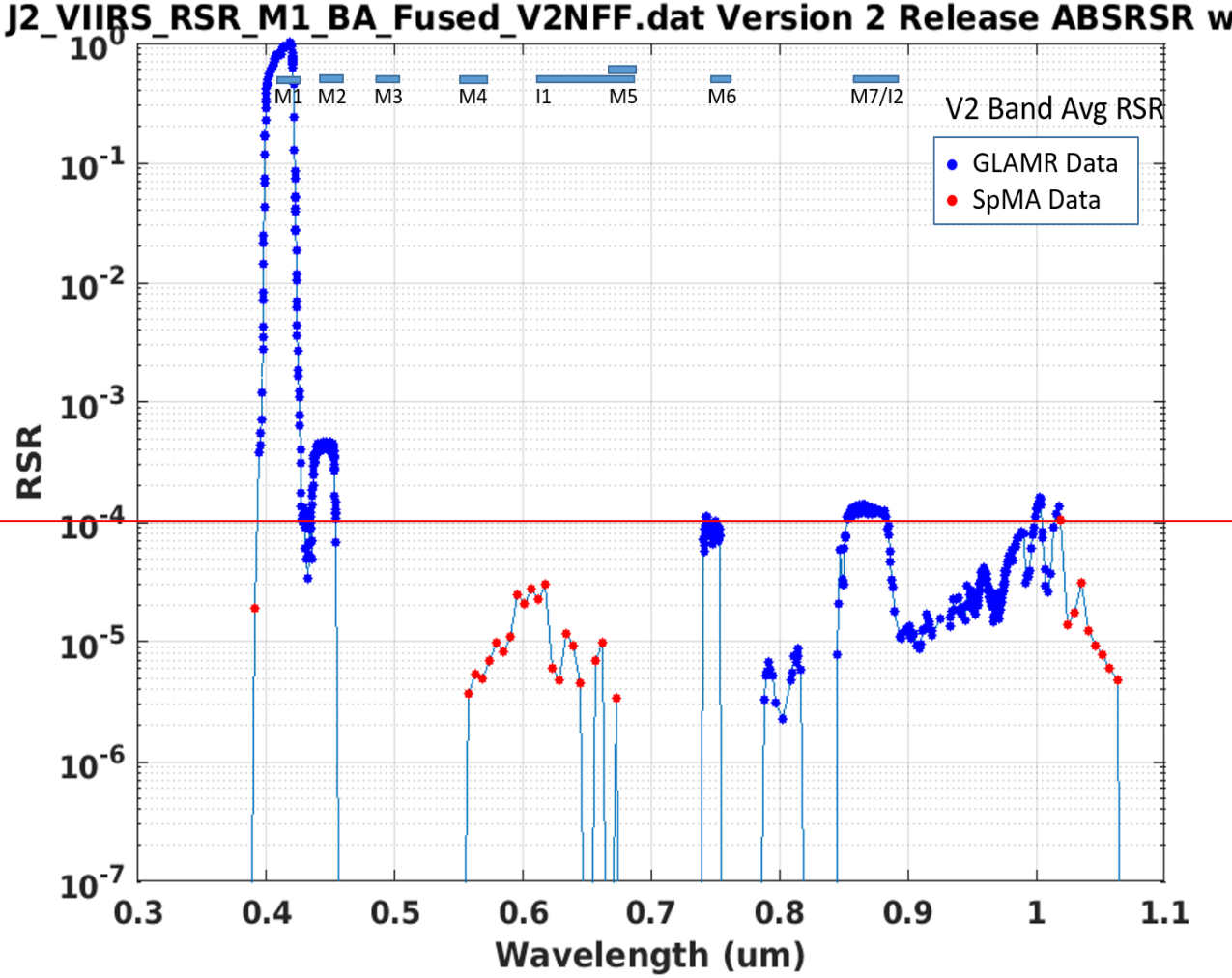
SpMA



GLAMR Filtered



J2 VIIRS



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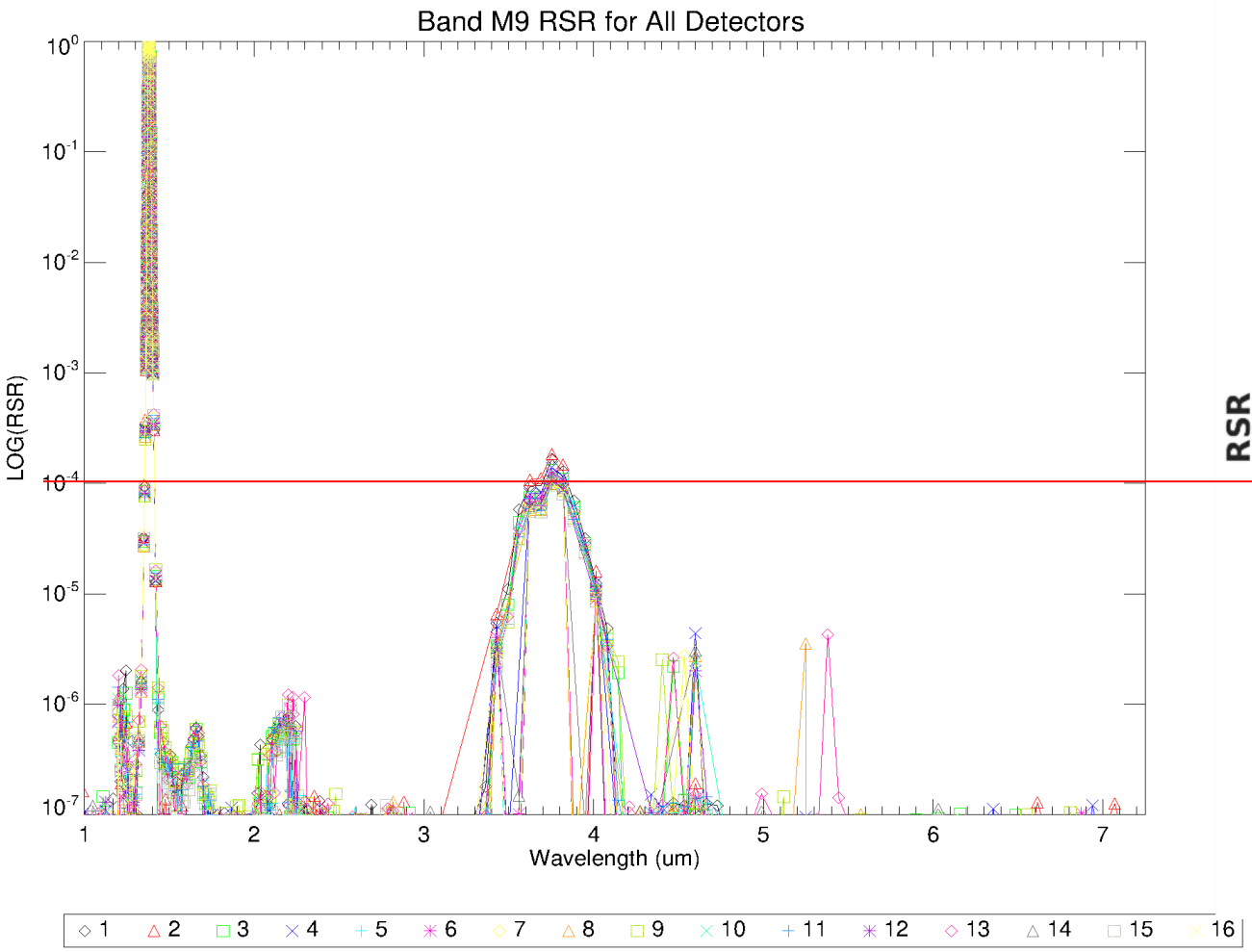
J3 VIIRS



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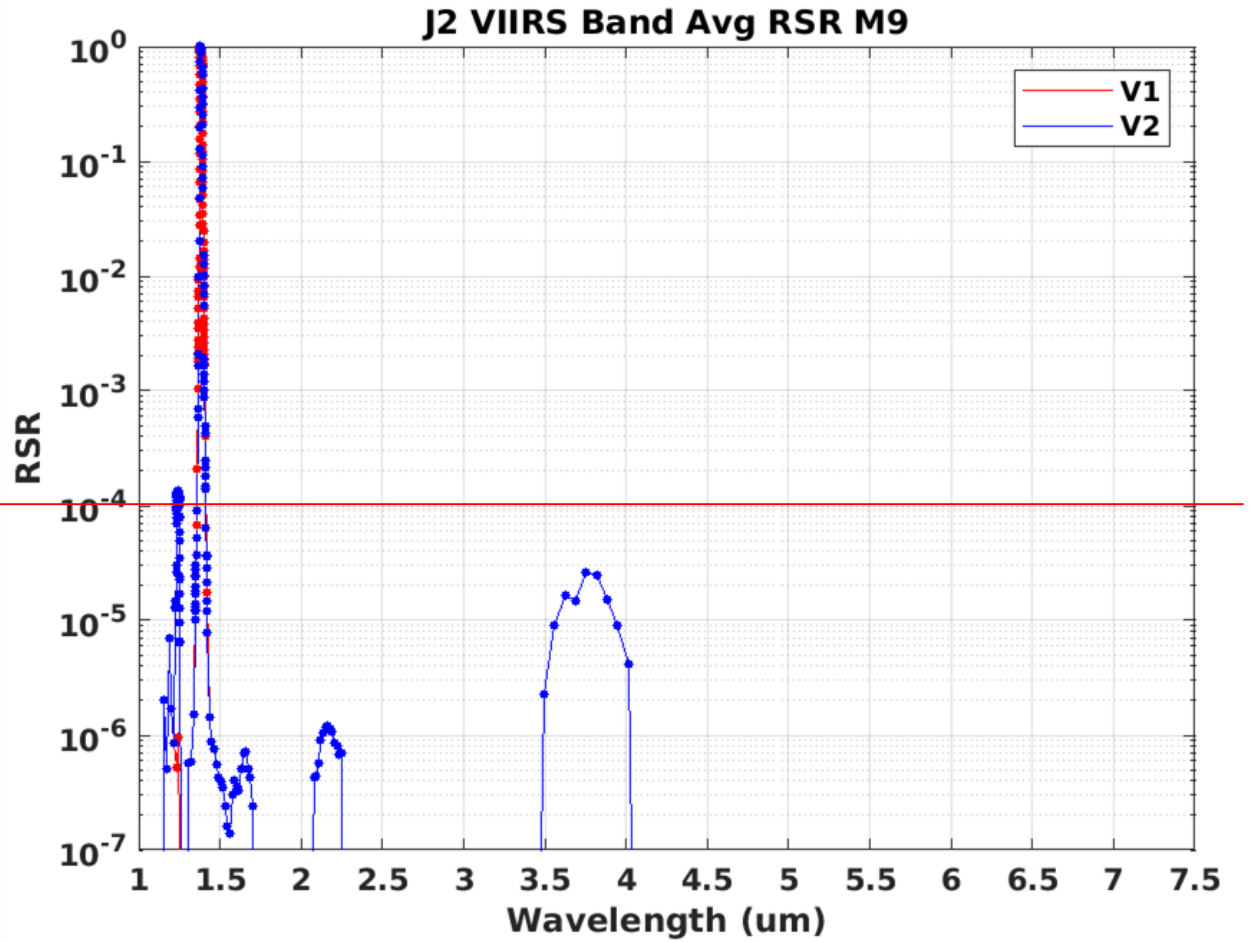

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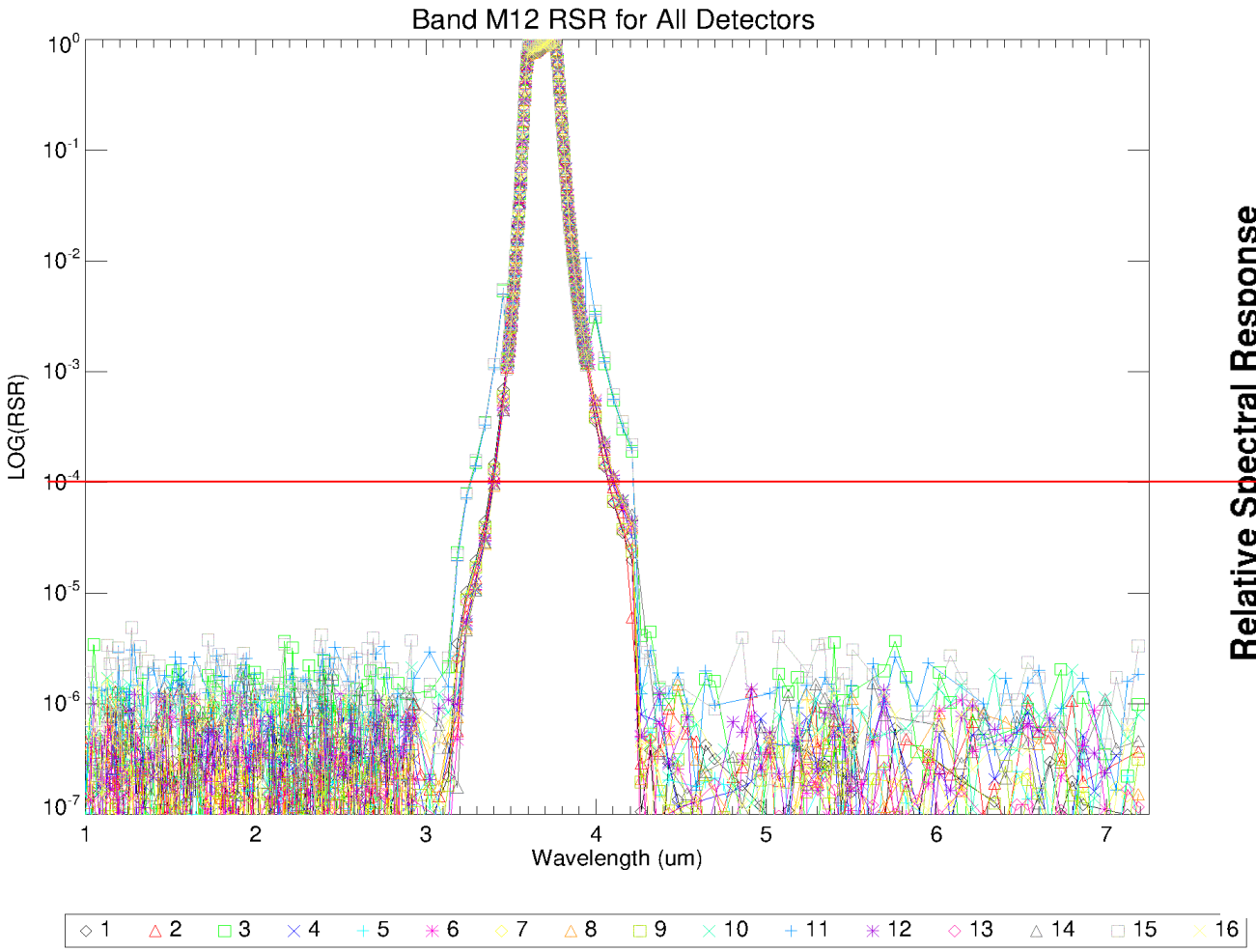

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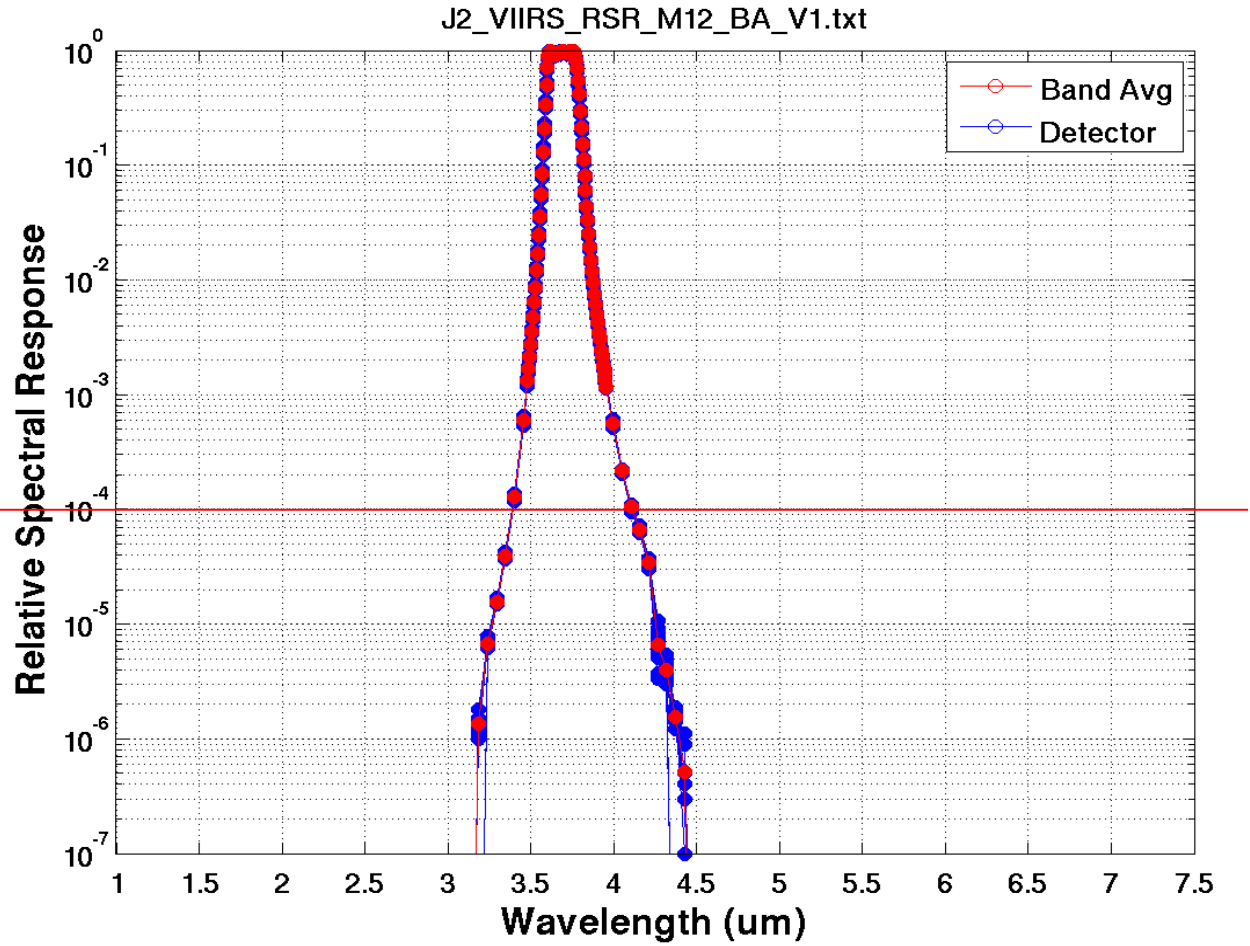

PRELIMINARY

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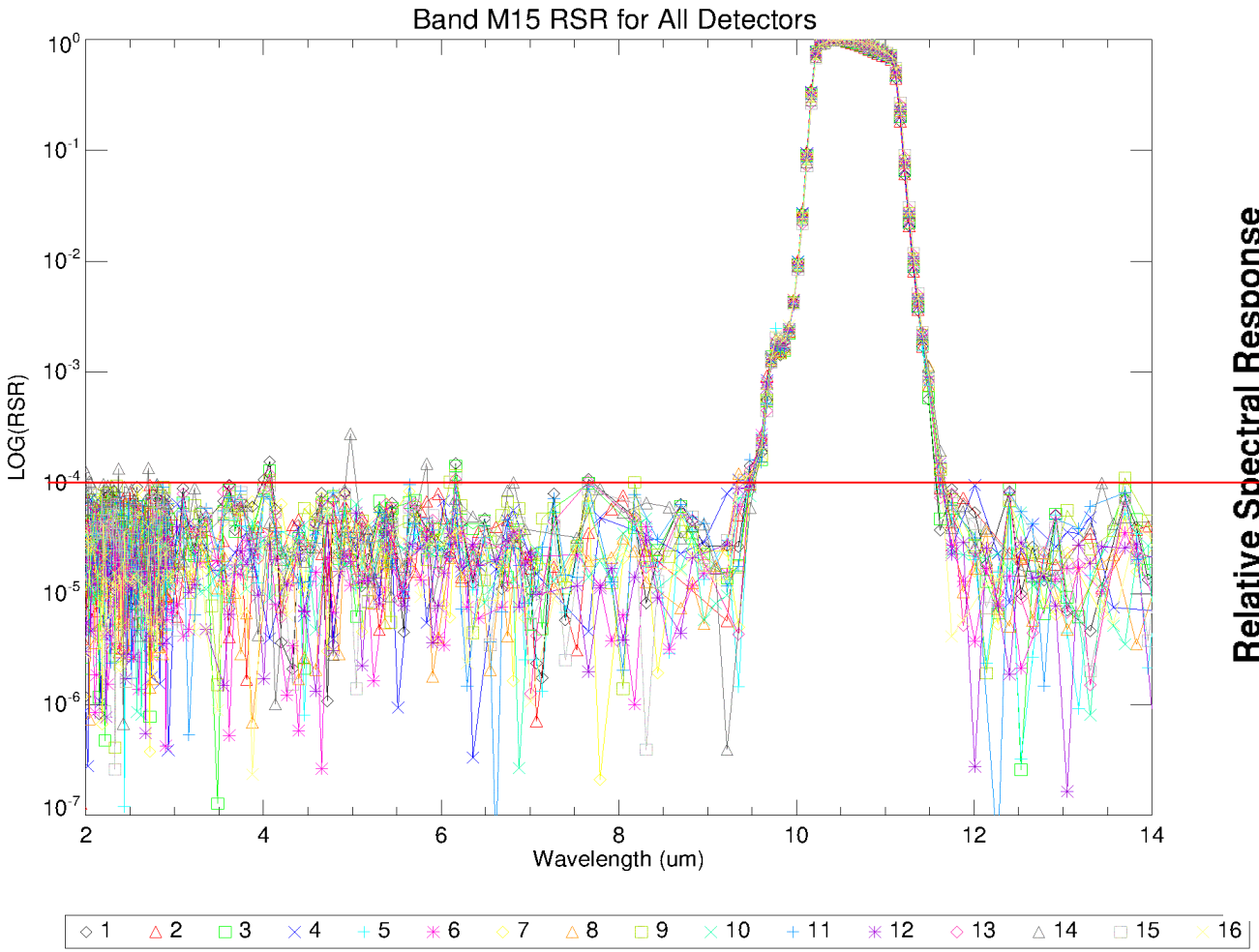

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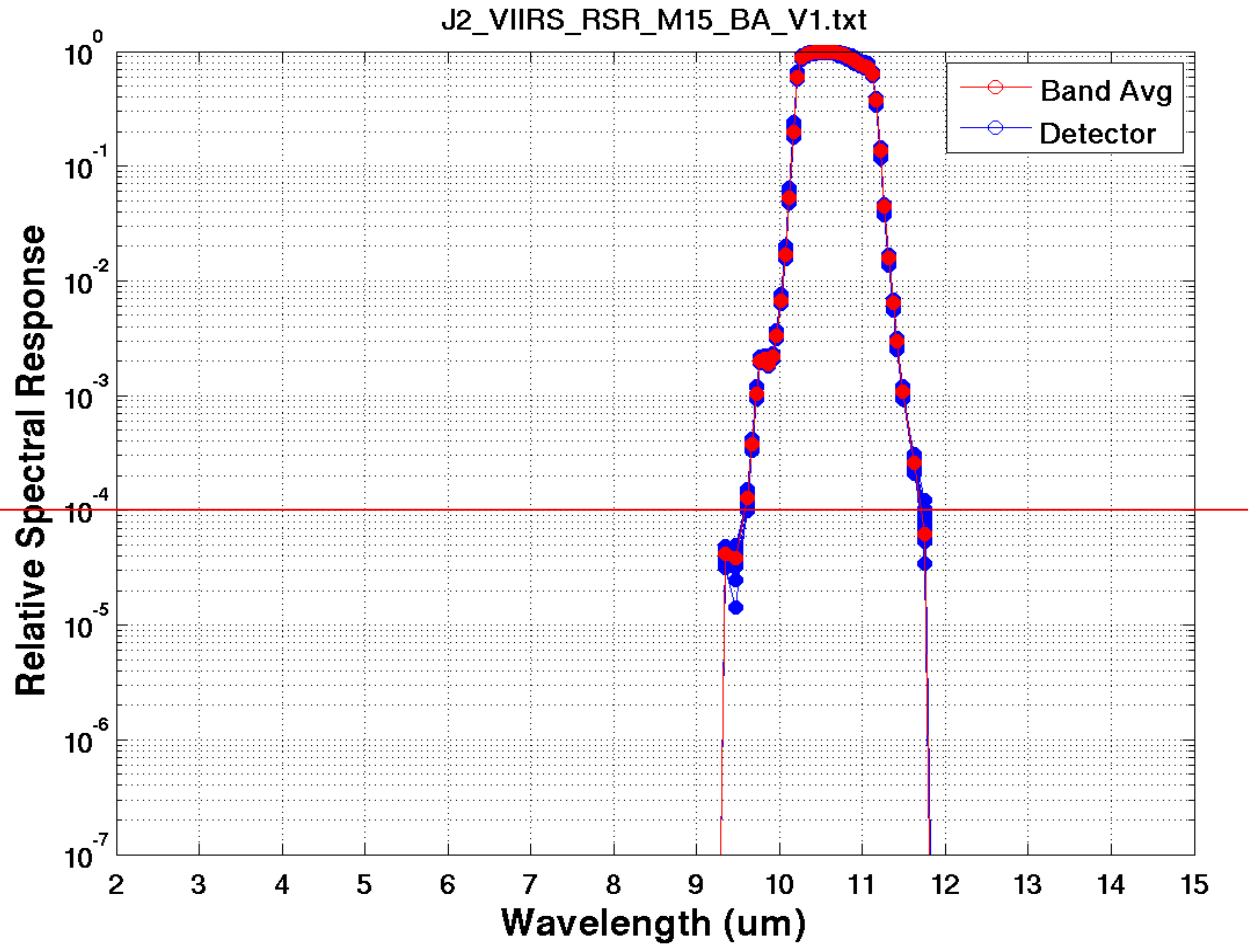
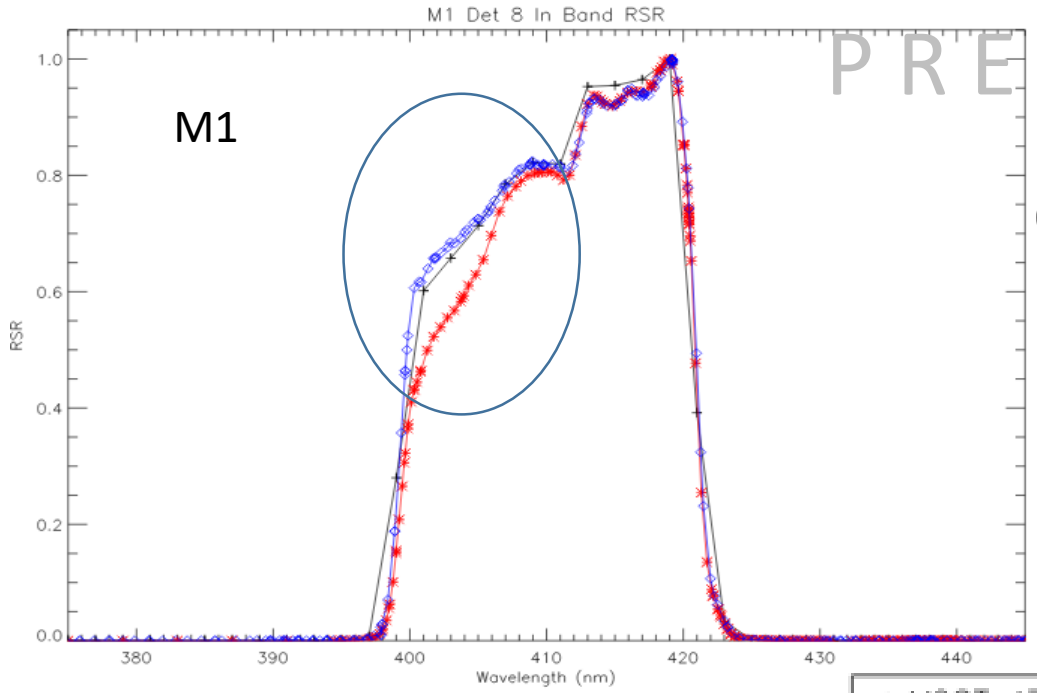
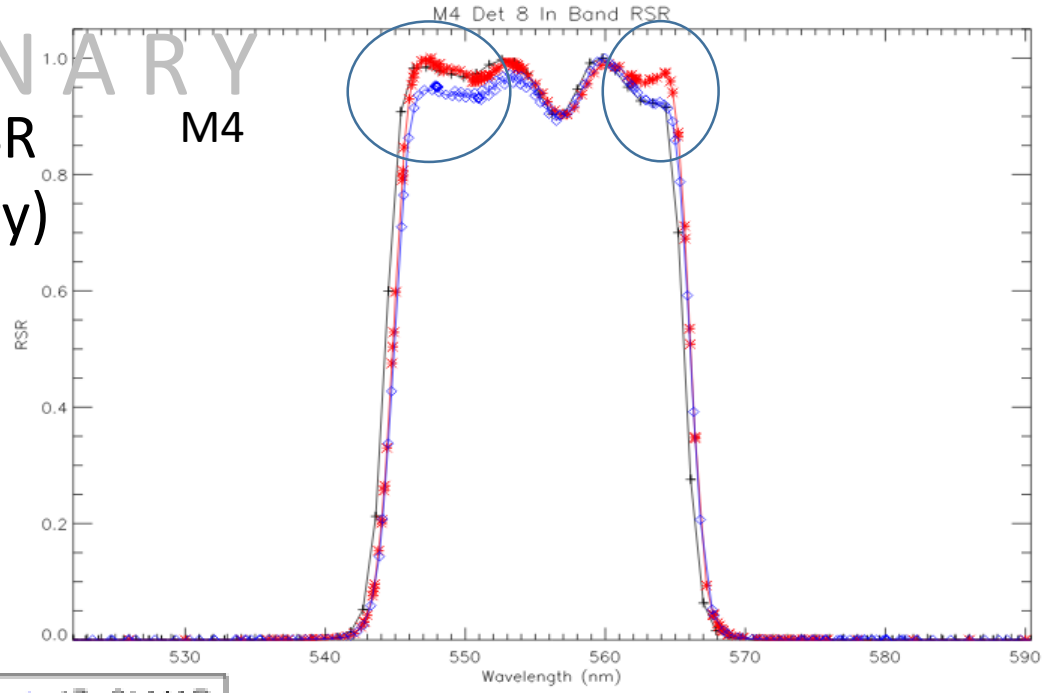


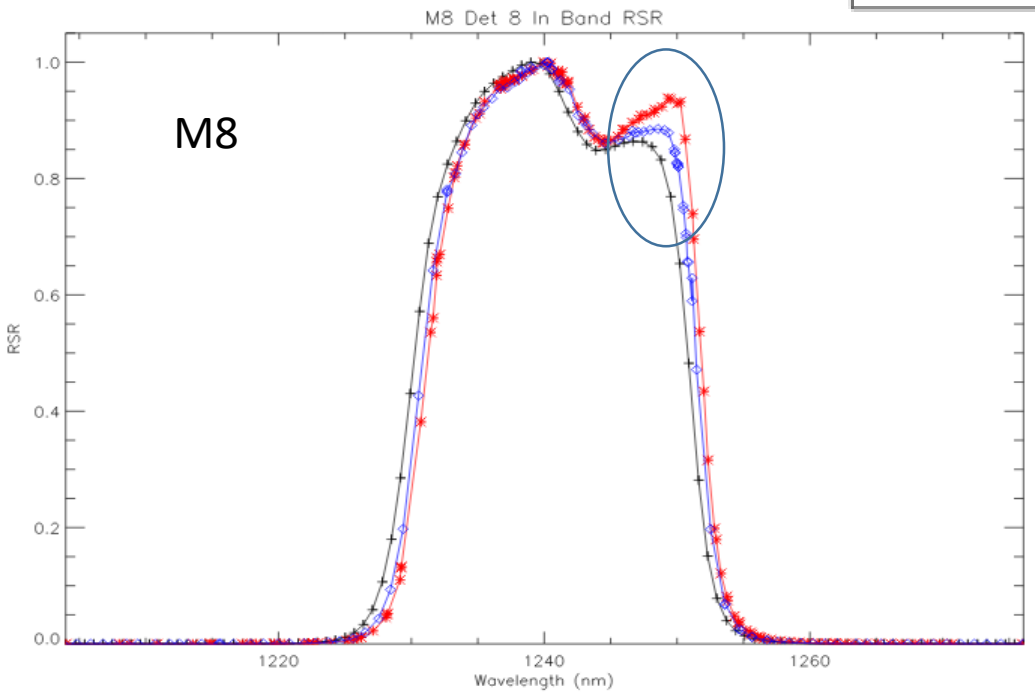
PRELIMINARY

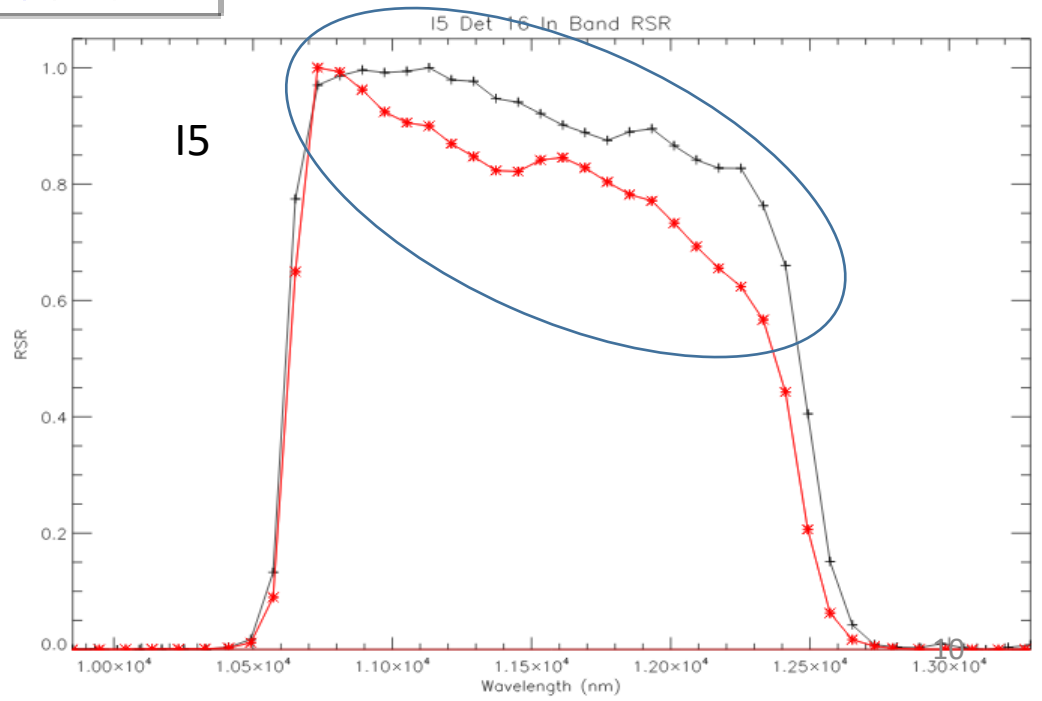
J3 VIIRS RSR (Preliminary)



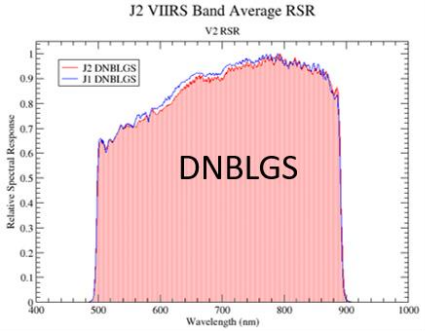


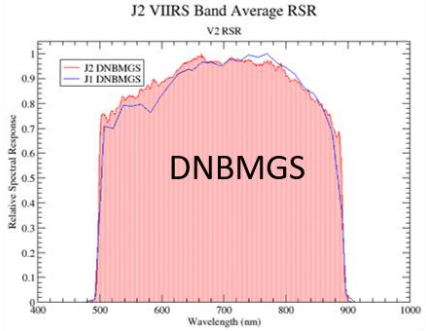
+ VCST J3 ✱ VCST J2 ◇ J3 GLMAR

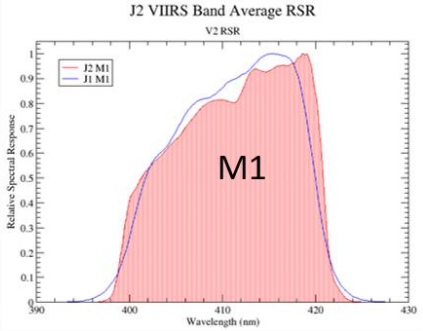


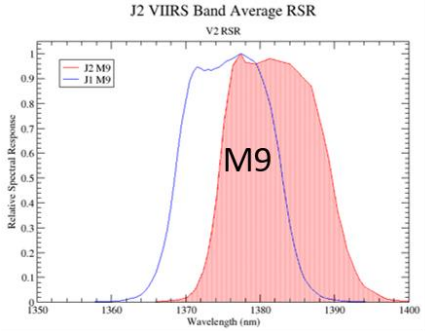


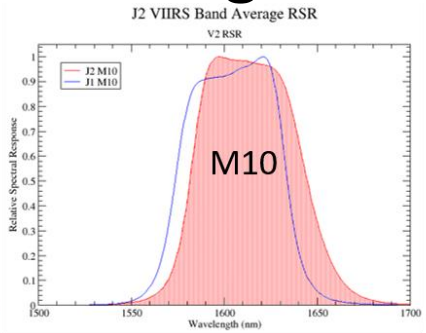
J2 VIIRS (red) vs NOAA-20 VIIRS (blue) Band Average RSR

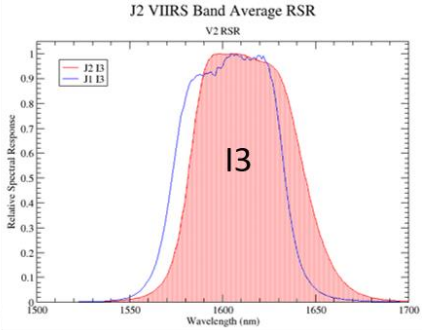


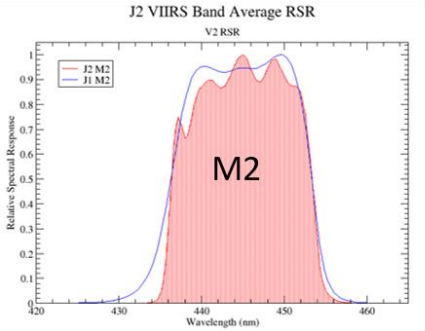


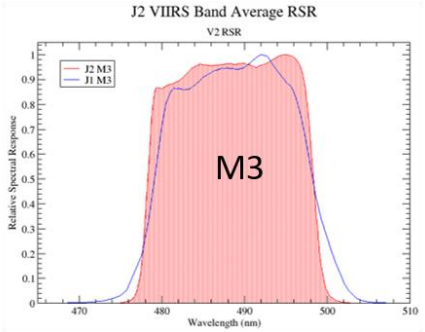


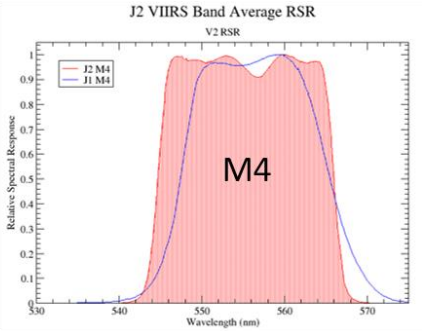


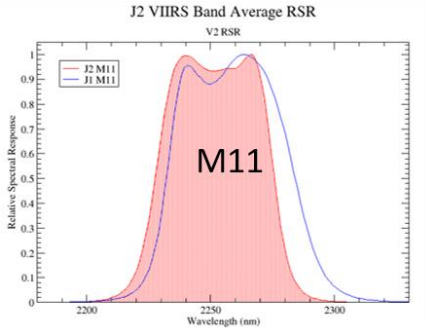


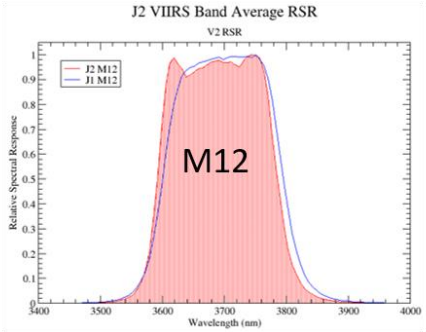


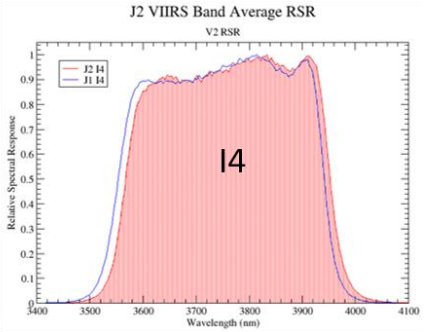


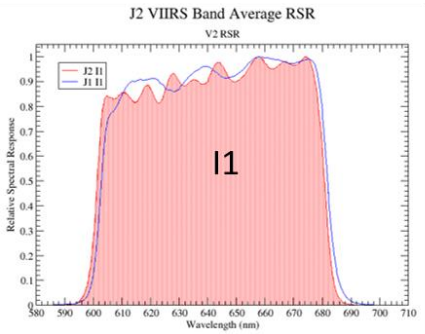


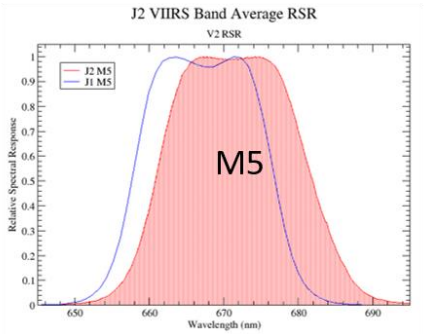


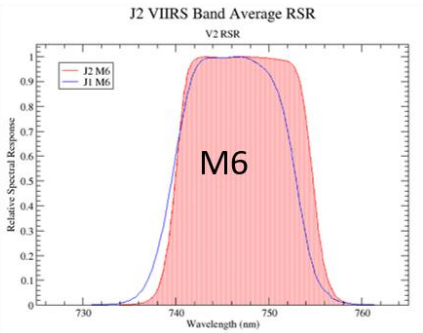


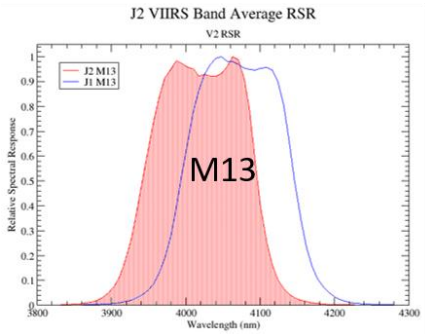


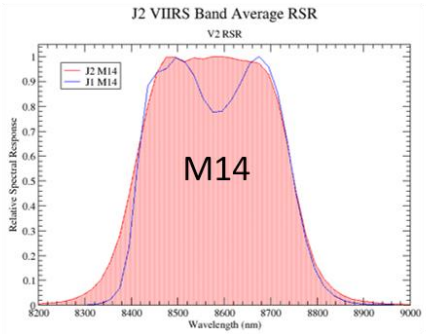


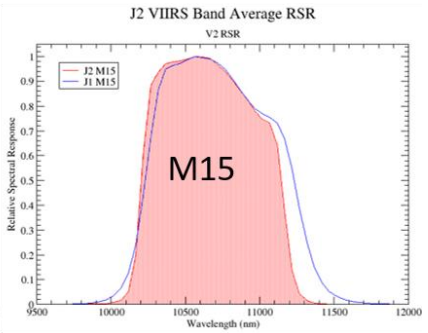


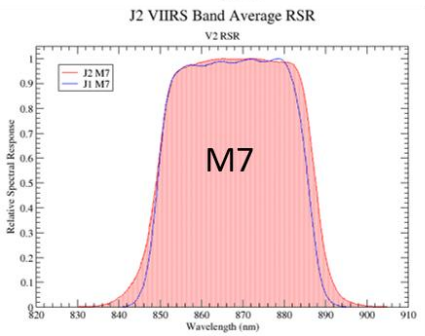


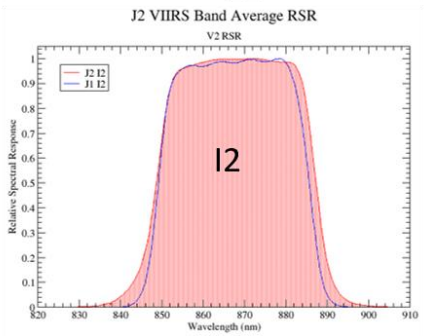


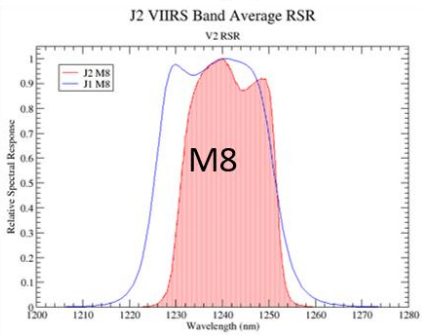


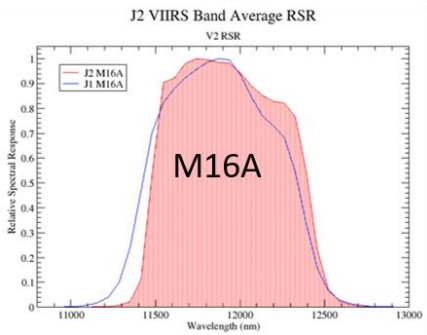


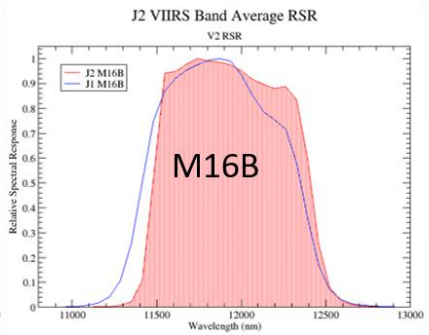


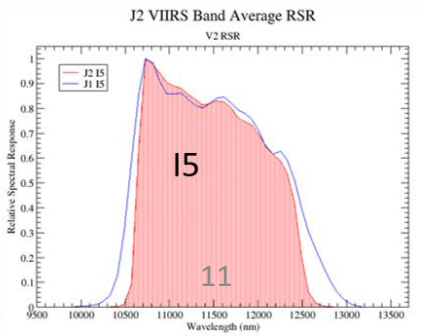




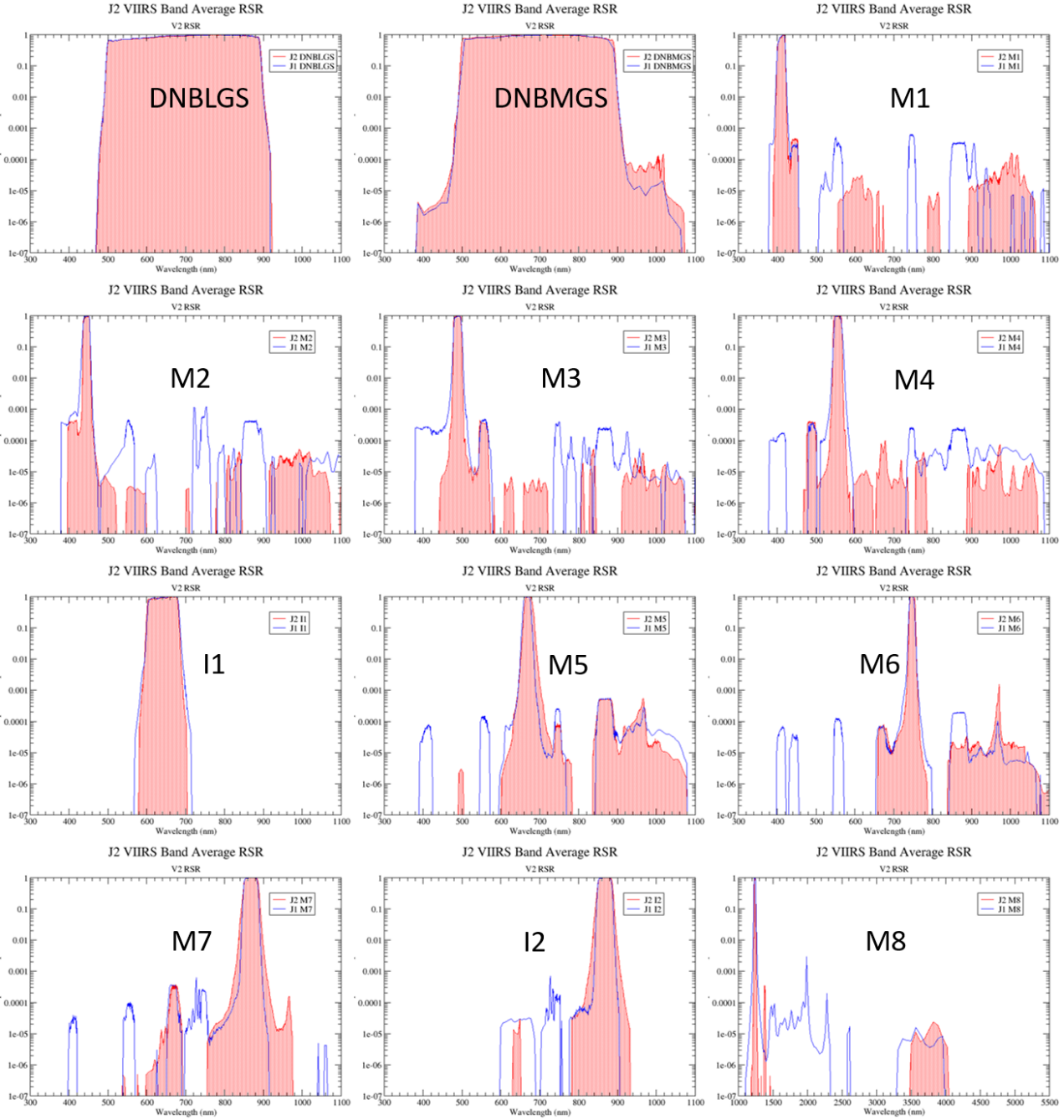


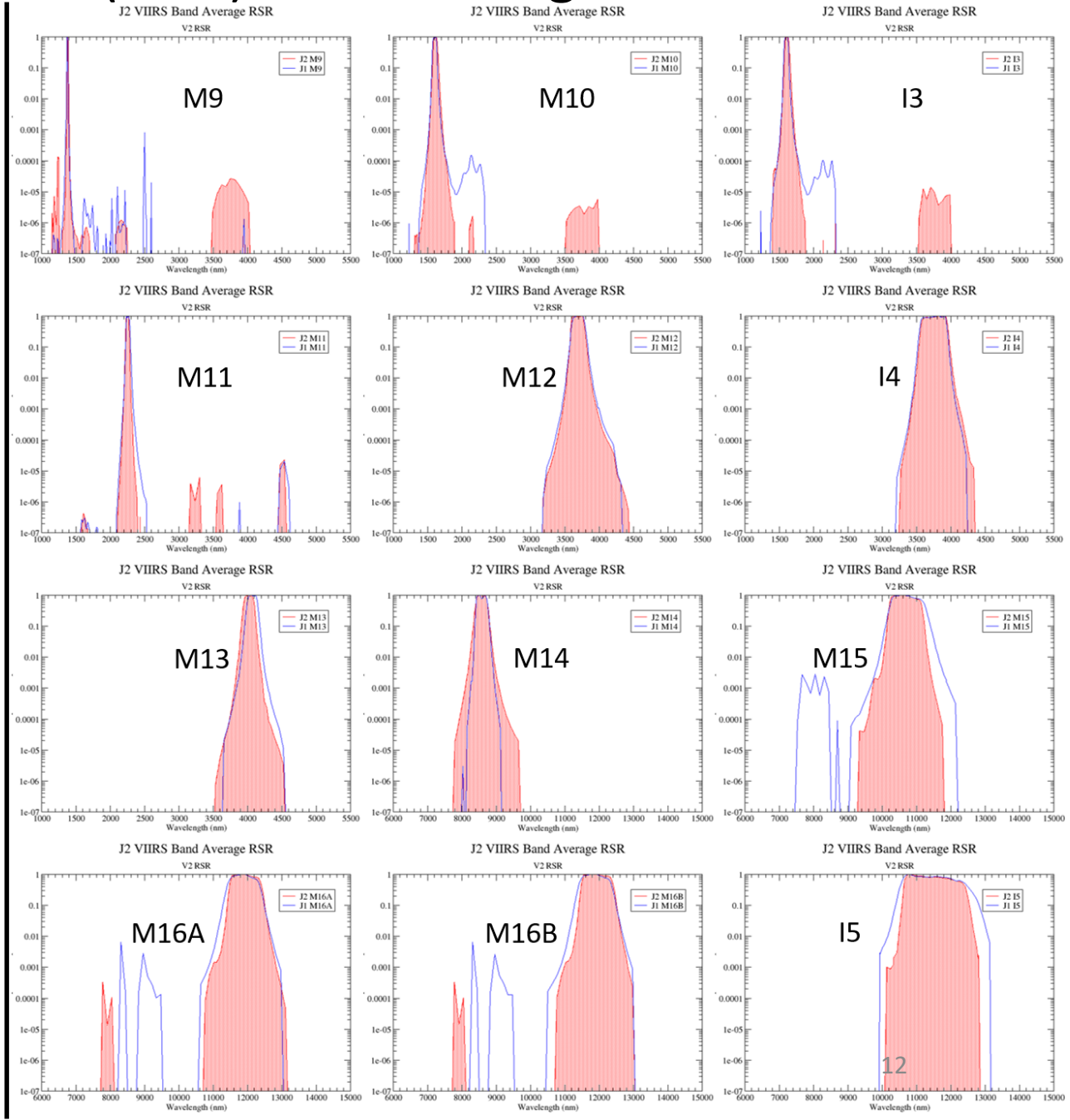




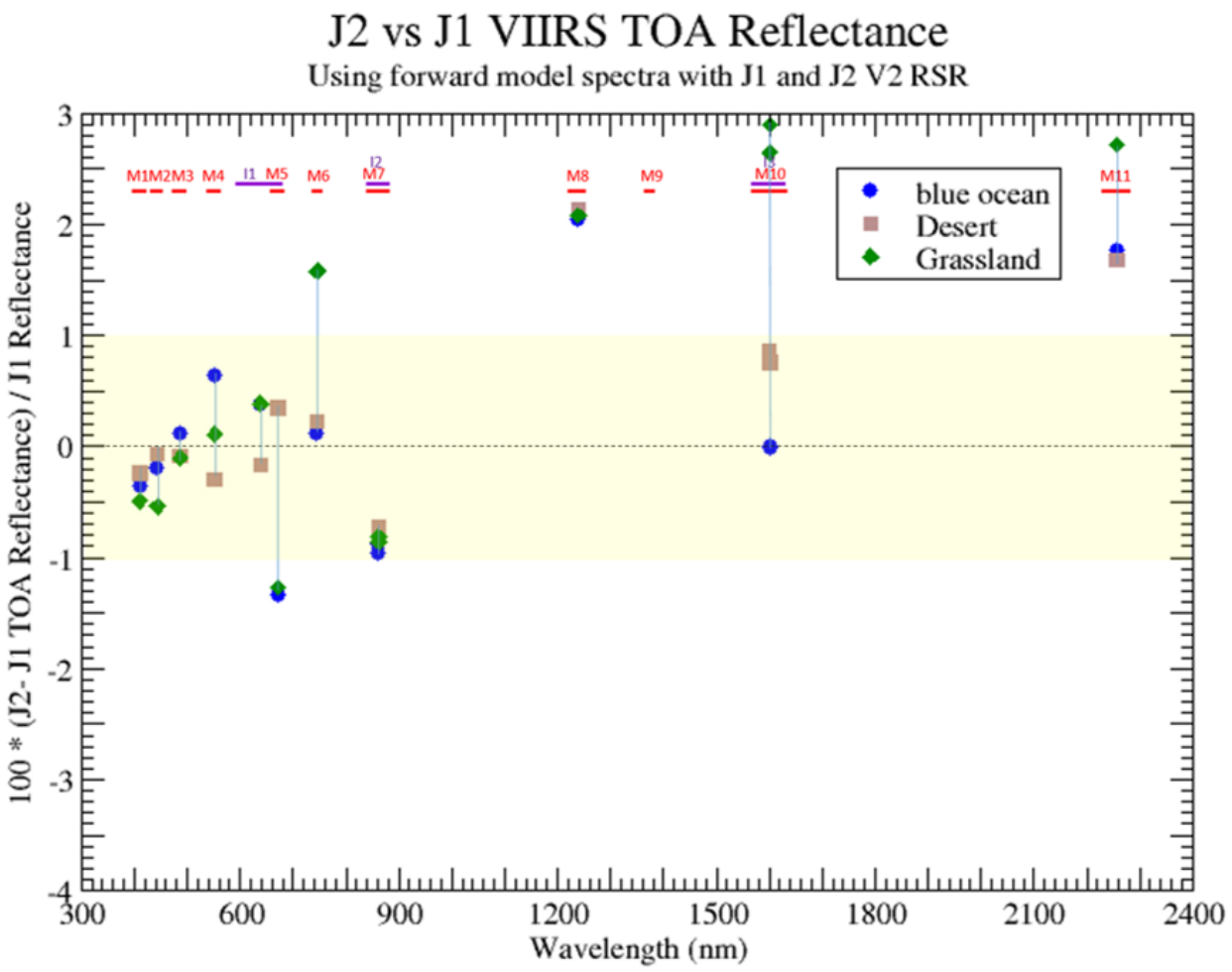


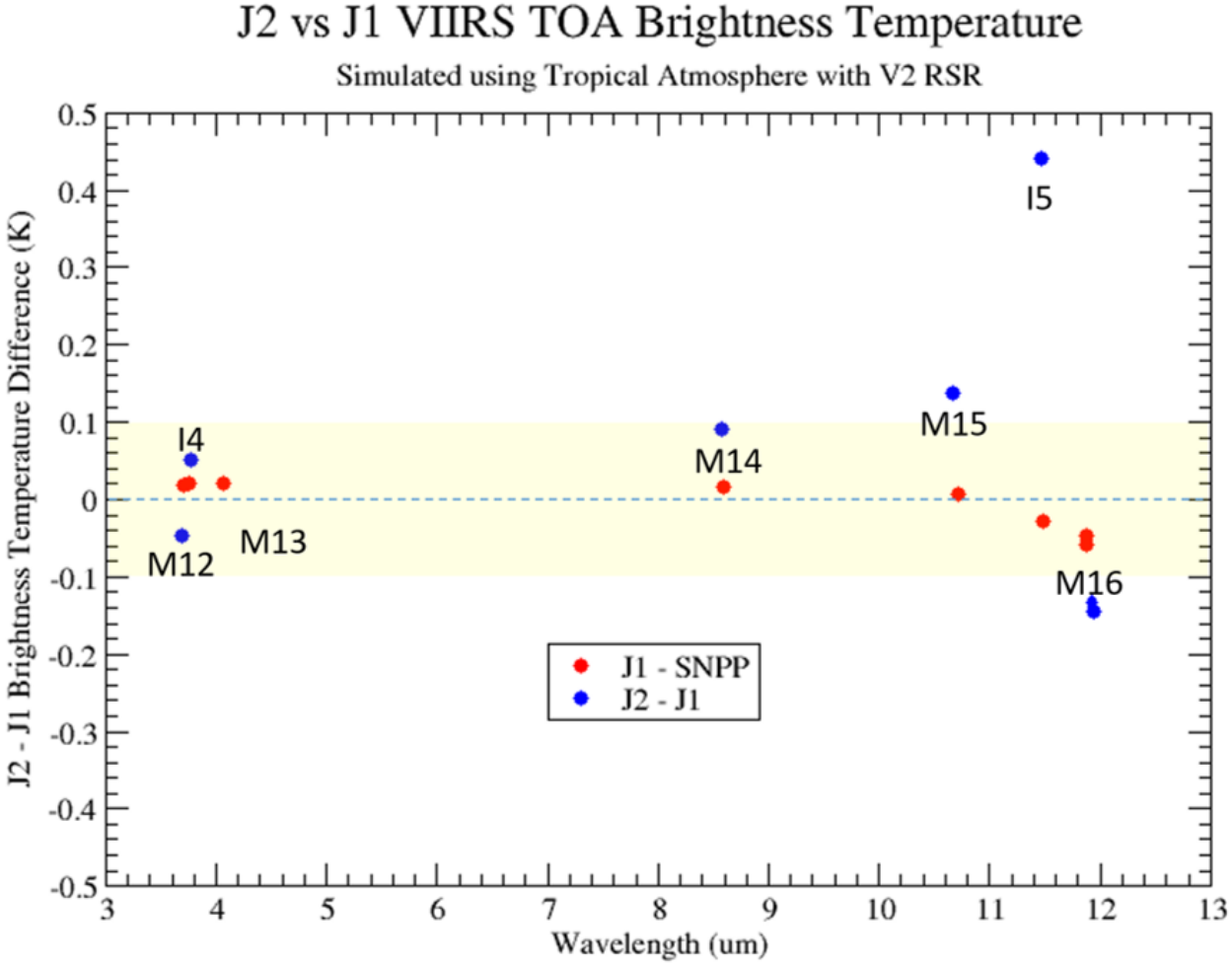
J2 VIIRS (red) vs NOAA-20 VIIRS (blue) Band Average RSR





TOA Impact


J2 vs J1 VIIRS TOA Reflectance
Using forward model spectra with J1 and J2 V2 RSR
100 * (J2- J1 TOA Reflectance) / J1 Reflectance
Wavelength (nm)
M1 M2 M3 M4 I1 M5 M6 I2 M7 M8 M9 I3 M10 M11
blue ocean
Desert
Grassland


J2 vs J1 VIIRS TOA Brightness Temperature
Simulated using Tropical Atmosphere with V2 RSR
J2 - J1 Brightness Temperature Difference (K)
Wavelength (um)
I5
I4
M15
M14
M13
M12
M16
J1 - SNPP
J2 - J1

Take-Away

- JPSS-3 VIIRS Spectral Calibration measurements are completed. Measurement goals to characterize response below 10^{-4} level has been achieved with some exception in LWIR.
- Very preliminary findings show close agreement with JPSS-2.
- A few bands show modest departures from JPSS-2 in the in-band spectral shape. These will be well documented by the measurements.
- JPSS-2 spectral calibration has departures from that of NOAA-20. JPSS-2 VIIRS V2 (“at-launch”) RSR have been released to public access: https://ncc.nesdis.noaa.gov/NOAA-21/J2VIIRS_SpectralResponseFunctions.php